

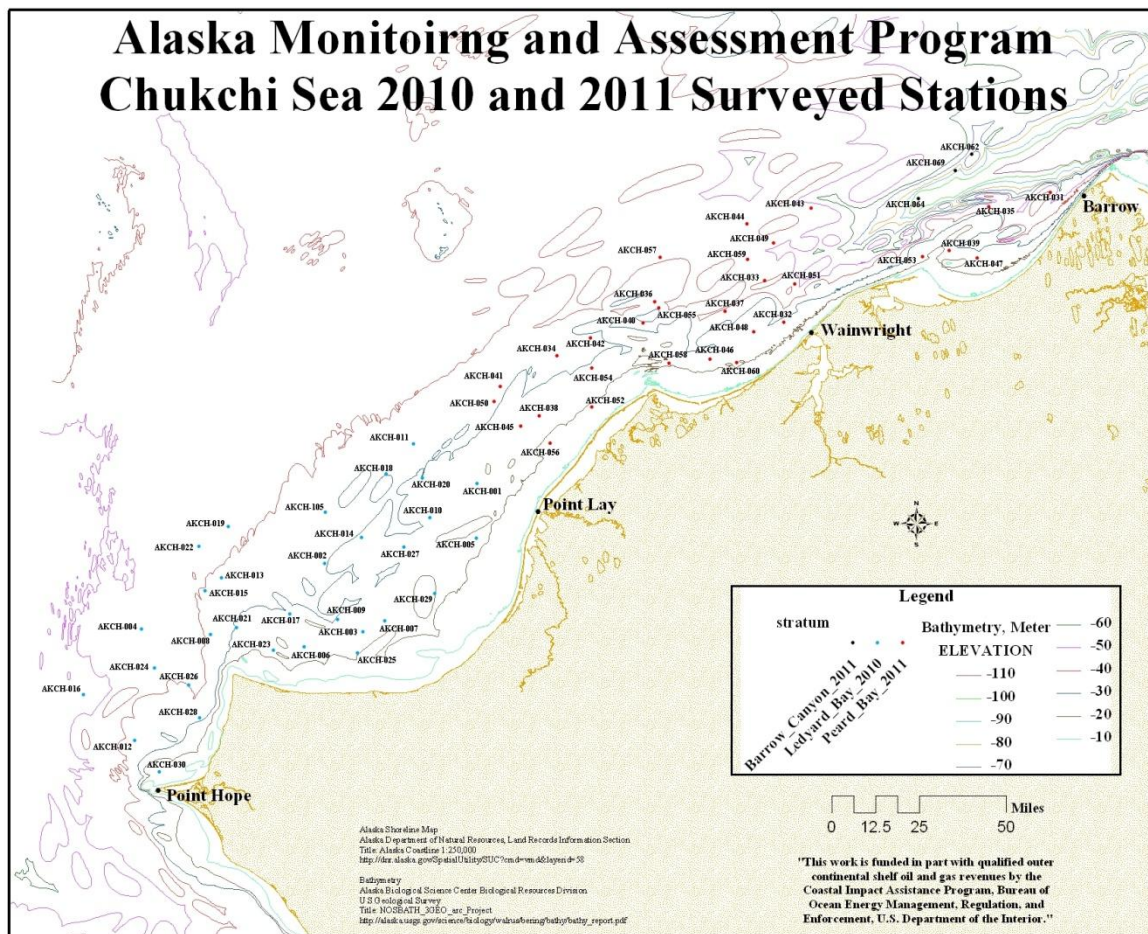
Cruise Report

Alaska Monitoring and Assessment Program (AKMAP) Chukchi Sea 2011 Coastal Impact Assistance Program Assessment

September 04 - September 17, 2011

Acknowledgements

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AKMAP Chukchi Sea 2011 Coastal Impact Assistance Program Assessment

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R/V Norseman II

The Alaska Department of Environmental Conservation (DEC) with its University of Alaska partner established an Alaska Monitoring and Assessment Program (AKMAP) focused on conducting aquatic resource surveys of Alaska's waters. DEC and the University of Alaska Fairbanks, School of Fisheries and Ocean Sciences conducted research cruises in 2010 and 2011 to survey the Chukchi Sea coastal environment. In 2011, the National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Program joined this effort.

AKMAP used a statistical survey design for the Chukchi Sea assessment to provide for estimates of the spatial extent of water quality status based on stressors, such as chemical contaminants, water quality parameters (pH, temperatures, salinity, and dissolved oxygen) and indicators, such as benthic fish abundance. Environmental managers use this information to support the protection and restoration of coastal marine environments, mitigate damage to the marine ecosystem and implement discharge monitoring requirements in NPDES permits. The purpose of the 2011 cruise was to assess the water quality and ecological status of waters of the northeast Chukchi Sea, from Pt. Lay to Barrow, between the 10 and 50 meter water depths within the Beaufort-Chukchi Coastal – Shelf ecosystem.

The AKMAP sampling team departed Oliktok Point, at Prudhoe Bay, late on September 4th, on small lightering vessels to the *R/V Norseman II* and departed for AKCH11-031 just to the Northwest of Barrow, AK. We arrived on station at 19:30 on September 5th. The field team consisted of nine ship crew and 13 scientists. Stations sampled in 2011 are shown in Figure 1.

Station sampling proceeded progressively southward until 09/09/11, when we attempted to move south to AKCH11-050, near Pt. Lay, but were turned back by rough weather. At that point we returned to near Wainwright and sampled AKCH11-060, 048 and 058 on 9/10/11. That evening we moved south to AKCH11-050 and began working from the south northward completing our 30th station, AKCH11-036 on 9/15/11. Over the 11-day sampling period 30 Base stations were occupied meeting our 100% completeness goal. No delays were experienced due to bad weather. Three stations were sampled on most days. Activities conducted at these three stations are shown in Table 1, with species associated with contaminant sampling listed in Table 2.

Upon completion of the 30 stations planned for 2011 we still had one field day remaining, losing no days to weather. Three stations, AKCH-062 (79 M), 064 (110 M) and 069 (98 M), (Figure 1) within the upper region of the Barrow Canyon target were selected for opportunistic sampling. Sediments encountered were fine sand with clay, with Station 064 containing a ubiquitous population of *Musculus discors*, forming thick byssal thread mats in the sediments.

Table 1. List of activities accomplished at stations on the AKMAP Chukchi Sea Peard Bay 2011 cruise											
Date	Station Id	Consecutive #	Depth, m	Plankton Tow (Vertical and Oblique)	Drop Camera*	CTD/WQ Collections	Van Veen Sediment Grab ^c	Beam Trawl**	Otter Trawl***	Biological Contaminant samples	Biological Isotope samples
9/5/11	AKCH11-031	1	60	X		X		X	X	X	X
9/6/11	AKCH11-035	2	54	X		X	X	X	X	X	X
9/6/11	AKCH11-047	3	27	X	X	X	X	X	X	X	X
9/6/11	AKCH11-039	4	28	X	X	X	X				
9/7/11	AKCH11-053	5	25	X	X	X	X	X	X	X	X
9/7/11	AKCH11-043	6	53	X		X	X	X	X	X	X
9/8/11	AKCH11-044	7	57	X		X	X	X	X	X	X
9/8/11	AKCH11-049	8	52	X		X	X	X	X	X	X
9/8/11	AKCH11-059	9	51	X		X	X ^d	X	X	X	X
9/08/11 ^a	AKCH11-033	10	52	X		X	X ^d	X	X	X	X
9/9/11	AKCH11-051	11	53	X		X	X ^d	X	X	X	X
9/9/11	AKCH11-032	12	26	X	X	X	X	X	X	X	X
9/09/11 ^a	AKCH11-048	13	32	X	X	X	X	X	X	X	X
9/10/11	AKCH11-037	14	44	X		X	X	X	X	X	X
9/10/11	AKCH11-57	15	46	X		X	X	X	X	X	X
9/11/11	AKCH11-060	16	22	X	X	X	X	X	X	X	X
9/11/11	AKCH11-046	17	27	X	X	X	X	X	X	X	X
9/11/11	AKCH11-058	18	24	X	X	X	X	X	X	X	X
9/12/11	AKCH11-050	19	33	X	X	X	X	X	X	X	X
9/12/11	AKCH11-45	20	30	X	X	X	X	X	X	X	X
9/12/11	AKCH11-056	21	20	X	X	X	X	X	X	X	X
9/12/11 ^a	AKCH11-038	22	28	X	X	X	X	X	X	X	X
9/13/11	AKCH11-041	23	32	X	X	X	X	X		X	X
9/13/11	AKCH11-052	24	17	X	X	X	X	X	X	X	X
9/13/11 ^a	AKCH11-054	25	25	X	X	X	X	X	X	X	X
9/14/11	AKCH11-034	26	34	X	X	X	X	X	X	X	X
9/14/11	AKCH11-042	27	37	X	X	X	X	X	X	X	X
9/14/11 ^a	AKCH11-040	28	39	X		X	X	X	X	X	X
9/15/11	AKCH11-055	29	40	X		X	X	X		X	X
9/15/11	AKCH11-036	30	43	X		X	X	X	X	X	X
9/16/11	AKCH-062	31	70	X		X ^b	X				
9/16/11	AKCH-069	32	98	X		X ^b	X				
9/16/11	AKCH-064	33	110	X		X ^b	X	X	X	X	X
			Totals	33	17	33	32	30	28	30	30
a - Drop cam., Zooplankton tows, CTD and Van Veen conducted night before and beam and otter trawl sequence done next morning.											
b - CTD profile only. No water samples.											
c - Generally sediment chemistry and macroinvertebrates.											
d - Sediment chemistry only no invertebrates.											
* = 5 minutes											
** = 2-5 minutes											
*** = 10 minutes											

Table 2. List of species collected for contaminants at stations on the AKMAP Chukchi Sea Peard Bay 2011 cruise

Date	Station Id	Consecutive Station #	Depth, m	Invertebrates										Fish					
				<i>Chlamys behringiana</i> (scallop)	<i>Astarte borealis</i> (clam)	<i>Neptunea heros</i> (gastropod)	<i>Anonyx nugax</i> (amphipod)	<i>Hyas coarctatus</i> (Lyre crab)	<i>Chionoecetes opilio</i> (Snow crab)	<i>Telmessus cheirogonus</i> (Helmet crab)	<i>Argis lar</i> (Northern Argid shrimp)	<i>Sclerocrangon boreas</i> (Sculptured shrimp)	<i>Tecticeps sp.</i> (Isopods)	<i>L. fubricii</i>	<i>M. scorpius</i>	<i>G. tricuspus</i>	<i>Mallotus villosus</i> (Capelin)	<i>A. hexapterus</i>	<i>Boreogadus saida</i> (Arctic cod)
9/5/11	AKCH11-031	1	60	X			X	X				X							
9/6/11	AKCH11-035	2	54			X	X	X			X	X							
9/6/11	AKCH11-047	3	27		X	X	X				X								
9/6/11	AKCH11-039	4	28																
9/7/11	AKCH11-053	5	25			X	X			X	X			X	X	X			X
9/7/11	AKCH11-043	6	53					X											
9/8/11	AKCH11-044	7	57		X	X	X	X			X								
9/8/11	AKCH11-049	8	52			X	X	X	X		X	X							
9/8/11	AKCH11-059	9	51			X	X	X			X	X							
9/8/11	AKCH11-033	10	52			X	X	X	X		X	X							
9/9/11	AKCH11-051	11	53				X	X			X	X							
9/9/11	AKCH11-032	12	26				X						X						
9/9/11	AKCH11-048	13	32				X	X			X								
9/10/11	AKCH11-037	14	44			X		X			X	X							
9/10/11	AKCH11-057	15	46			X		X			X	X							
9/11/11	AKCH11-060	16	22			X	X			X	X	X		X	X	X	X		X
9/11/11	AKCH11-046	17	27				X				X	X					X		
9/11/11	AKCH11-058	18	24				X	X			X				X	X	X		X
9/12/11	AKCH11-050	19	33			X		X	X		X	X							
9/12/11	AKCH11-045	20	30			X		X			X	X		X	X	X	X		X
9/12/11	AKCH11-056	21	20							X	X							X	
9/12/11	AKCH11-038	22	28					X			X	X				X		X	
9/13/11	AKCH11-041	23	32			X		X	X		X								
9/13/11	AKCH11-052	24	17								X						X	X	
9/13/11	AKCH11-054	25	25				X	X			X	X							
9/14/11	AKCH11-034	26	34					X	X		X	X							
9/14/11	AKCH11-042	27	37					X	X		X								
9/14/11	AKCH11-040	28	39			X		X			X	X							
9/15/11	AKCH11-055	29	40			X		X			X								
9/15/11	AKCH11-036	30	43			X	X	X			X								
9/16/11	AKCH-062	31	70																
9/16/11	AKCH-069	32	98																
9/16/11	AKCH-064	33	110						X			X							
Total				1	2	16	16	22	7	3	26	17	1	3	4	5	5	3	4

Station sampling activity typically occurred, with some exceptions, in the following sequence: drop camera; vertical and oblique zooplankton tow; conductivity, temperature and depth (CTD) profiles (with some auxiliary measurements); Niskin bottle water samples; Van Veen grab sediment collection; beam trawl and otter trawl. The drop camera was deployed to record/characterize the benthic substrate; only 17 sites were within the depth range (~45 meters) of the system. A two to five minute video was recorded on DVD as a station reference.

Voucher specimens were collected and various photographs of the cruise were taken to enhance subsequent reports. Organisms from each station were also collected for stable isotope analyses, which help us to understand the existing food web. All biological, sediment, and water samples were preserved (frozen, ETOH, formalin, nitric acid, or refrigerated) on board. At cruise completion samples will either be analyzed at UAF or at Texas A&M Geological Environmental Research Group (GERG) laboratory. Analytes typically being run on the collected environmental media (water, sediments, and tissues) are shown in Table 3.

Table 3 – Analytes

Analytes	Water (Individual Niskin bottles*)	Marine Sediments	Biological Tissue Samples
Dissolved Nutrients	X		
Chlorophyll a	X		
Sediment Chlorophyll a		X	
Total Suspended Solids	X		
pH, Salinity, Dissolved Oxygen (CTD check sampled)	X		
Dissolved Inorganic Carbon, Total Alkalinity, and pH (for pCO ₂)	X		
Trace Metals		X	X
Hydrocarbons		X	X
PCB's & Organochlorine pesticides		X	X
Total Organic Carbon		X	
Total Inorganic Carbon		X	
Sediment Grain Size		X	
Stable Isotopes (¹³ C& ¹⁵ N)		X	X
% Lipids			X

Holo- and meroplanktonic organisms, as well as cnidarians were sampled at a total of 33 stations. Two tows were executed at each station, which consisted of a 10 minute double oblique tow with 505 µm mesh nets while the ship was underway at an average of two knots to target larger more mobile zooplankton. A five minute vertical haul with 150 µm nets while the ship was stationary was done to capture smaller more fragile zooplankton. General Oceanic flow meters were mounted in all nets to calculate volume of water filtered and TDRs were attached to the vertical frames for accurate target deployment depth. Samples from the “A” nets were preserved for species composition, abundance and biomass analysis. Samples from the “B” net were preserved ethanol for genetic sequencing. If the A sample was compromised due to jellyfish the B sample was then preserved.

The CTD (SBE 25 attached to a SBE 55) was operated autonomously rather real-time as the Eco-Winch wire line cable had a break occur in the conductor wire at an unknown location during the previous cruise. Water collections occurred with Niskin bottles from the two meter depth, mid-

depth and two to three meters off the bottom, using either a SBE 55 timed mode or the SBE 55/SBE25 pressure sequence setting. At the 33 stations conductivity, pressure and temperature measurement profiles were taken. Due to problems, which were overcome, fluorescence, pH, dissolved oxygen and PAR were not taken at the first 15 stations. After the 15th station (AKCH11-057) casts were also taken with a SBE 19Plus, providing backup CTD measurements. The CTD data was downloaded daily and backed up nightly. Water samples were taken at the three depths for dissolved nutrients, chlorophyll a, and total suspended solids. No water samples were collected at the Barrow Canyon stations, 062, 069 and 064. Samples were also taken at the two meter depth for an dissolved inorganic carbon, total alkalinity and pH for Dr. Jeremy Mathis for ocean acidification assessment (pCO₂ measurements). No water samples were collected at the Barrow Canyon stations, 062, 069 and 064. On board measurements for pH and refractometer salinity checks were made from each depth collected. A limited number of modified Winkler method dissolved oxygen checks were also completed as part of the Quality Control and Assurance.

Benthic infaunal, sediment grain size, and chemistry samples were collected using double Van Veen sediment sampler. Rocks and cobble at four sites prevented the collection of sediment samples. Three replicate benthic infaunal samples from 26 sites were washed on a 1mm mesh screen. One benthic infaunal sample will be processed for taxonomic identification, with the remaining two held for future processing depending upon funding.

Demersal fishes and epibenthic invertebrates were sampled from beam trawl hauls, and fishes were sampled from otter trawl hauls. The 3.05 m plumb-staff beam trawl was 7 mm mesh in the body, with a 4 mm codend liner, double tickler chain and 16 cm sections of chain attached to the footrope at 16 cm intervals; it was fished for 2-5 minutes at 1-1.5 kt. Beam trawl hauls were quantitative for area fished at all stations, with the exception of AKCH11-062, 069 and 039 where no trawls were conducted. The 9.1 m otter trawl had 38 mm mesh in the body, 19 mm mesh in the codend, 27.5 m bridles and 61x122 cm (23 kg) doors; it was fished for 10 minutes at 2-2.5 kt. The otter trawl hauls were quantitative for area fished at 28 sites. Temperature depth recorders (Star-Oddi Centi or Tilt) were attached to net headropes and downloaded each night; data from these units were used to determine whether nets had fished consistently on the sea floor.

A marine bird and marine mammal transect observations were conducted by respectively by Tawna Morgan and Amber Stephens of ABR, Inc. Presence of sea birds or marine mammals did not impact the cruise operations. Once the transect data is analyzed a report will be provided to AKMAP.

On September 17, 2011, the AKMAP scientific team departed the Norsemann II at Wainwright. The success of this cruise was attributed to the following outstanding personal:

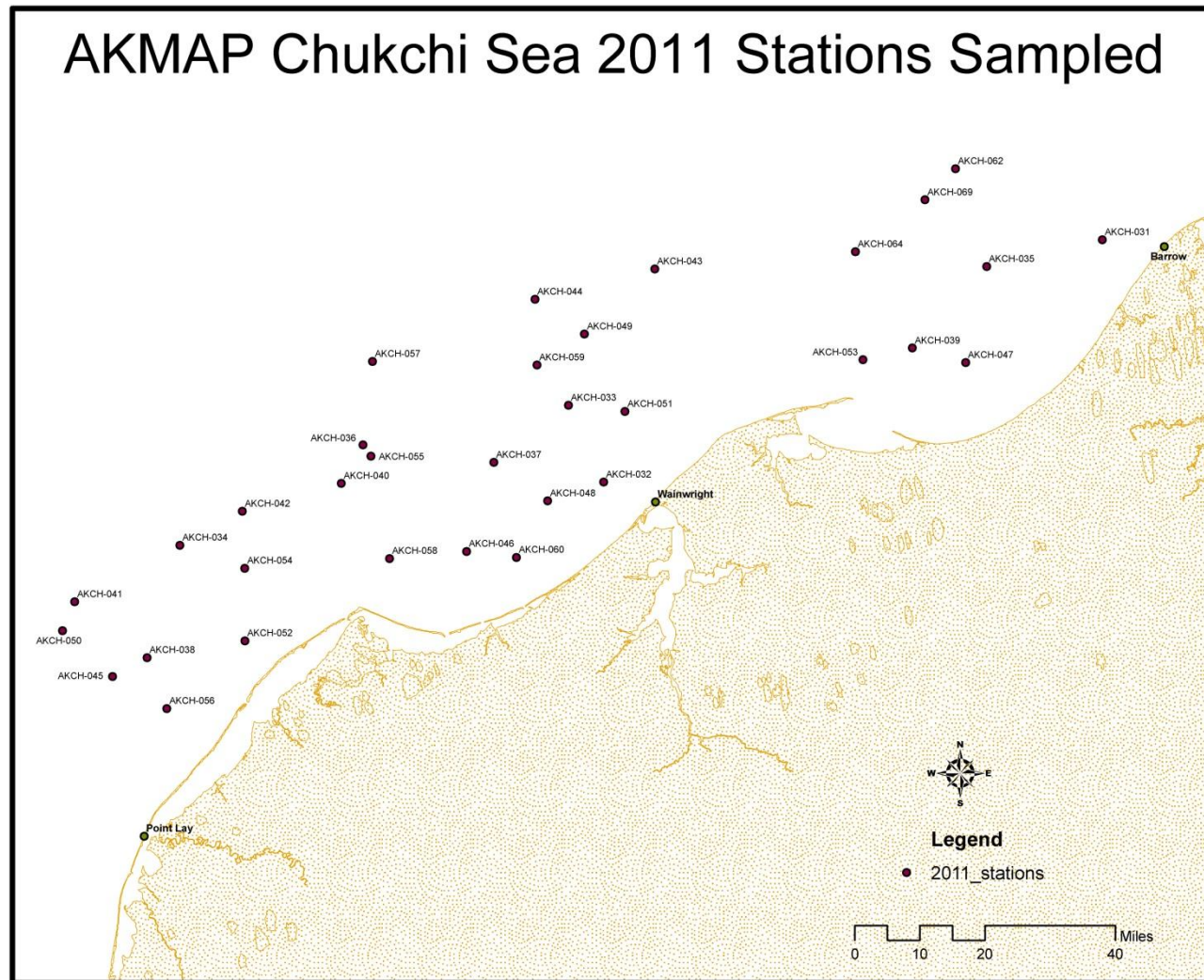
<u>Crew of the R/V Norseman II</u>	<u>Scientific Crew</u>
Captain Jack Molan	Terri Lomax, DEC
Mate Perry Seyler	Brenda Holladay, UAF
Engineer Todd Campbell	Patricia Rivera, UAF
Engineer David Christenson	Heloise Chenelot, UAF
Cook Evan Dunaway	Nora Foster, Contractor
Cook Joanne Molan	Max Hoberg, UAF
Boatswain Scott Hameister	Roger Clark, Contractor
Able Seaman Charlie Watson	Ian Hartwell, NOAA
Able Seaman Jim Wells	Jennifer Questel, UAF
	Benjamin Gray, UAF
	Amber Stephens, ARB, Inc.
	Tawna Morgan, ABR, Inc.

Douglas Dasher, Ph.D., ADEC, Affiliate Professor UAF SFOS
Chief Scientist
September 28, 2011

Note:

The Norseman II reported a discrepancy in reported depths on Sept 13, 2011. After further investigation it was determined that depth has been over reported by ~8m from the onset of the cruise. In programming the NII fathometer to account for ship berth a 12 ft correction was added, the instrument was then changed to report depth in meters. The 12 foot correction was not converted to meters therefore depths were exaggerated by 12 meters. Station depths and corresponding calculations were adjusted by subtracting 8 meters from reported depths. Stations occupied on Sept 13, 2011 (AKCH11-041) to the end of the cruise are assumed to be the correct depth.

Figure 1 - 2011 AKMAP Chukchi Sea Stations



AKMAP CIAP Chukchi Sea 2011 Vessel and Scientific Crew

